# Mangalore University

**Synopsis of the PhD. Research - Business Administration - TTM**

**In**

# WASTE MANAGEMENT PRACTICES IN SELECTED HILL STATIONS OF KERALA- A POLICY IMPLEMENTATION APPROACH

***Submitted by***


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# Table of Contents


**1. Introduction** ..... 1

**2.Waste Management in Hill Stations** ..... 3

**3. Research Questions** ..... 5

**4. Research Objectives** ..... 6

**5. Scope of the Study** ..... 7

**6. Structure of the Thesis** ..... 7

**7.Limitations of the Study** ..... 8

**8. Review of Literature** ..... 8

**8.1 Introduction** ..... 8

**8.2 Waste Management in India** ..... 9

**8.3 Kerala's Decentralized Approach** ..... 9

**8.4 Challenges in Hill Stations and Rural Areas** ..... 9

**8.5 Role of Community Participation and Awareness** ..... 10

**8.6 Technological Innovations in Waste Management** ..... 10

**9.Statement of the Problem** ..... 11

**10.Sources of Literature** ..... 13

**10.1 Key Themes** ..... 13

**Inclusion Criteria** ..... 13

**Exclusion Criteria** ..... 14

**11.Research Methodology** ..... 14

**12 Conceptual model** ..... 15

**8.1 Key Components:** ..... 15

**13.Construction of Questionnaire** ..... 16

**14.Theocratical background** ..... 17

**15.Development of Hypotheses** ..... 18

**16.Relevance of Constructs** ..... 19

**17 . Data analysis and interpretation** ..... 21

**17.1 Introduction to Analytical Framework** ..... 21

**17.2 Descriptive Statistics Overview** ..... 21

**17.3 Reliability and Normality** ..... 22

**18. Thematic Analysis and Interpretation** ..... 23

**18.1 Thematic Analysis Framework** ..... 23
**18.2 Key Themes Emerged** ..... 23
**19. Integration with Hypotheses (Quantitative vs. Qualitative)** ..... 24
**20. Findings, Recommendations, and Conclusions** ..... 25
**20.1 Key Findings** ..... 25
**20.2 Recommendations** ..... 26
**Conclusion** ..... 27
**References** ..... 28
**Publication Details** ..... 29

# List of Table


| Sl. No | Table No | Table No |
|---|---|---|
| 1 | Overview of Kerala's Waste Management | 2.1 |
| 3 | Table showing Research Gap, Research Objective, Research Questions Mapping | 9.1 |
| 3 | Hypothesis Testing Results | 17.1 |
| 4 | Integration with Hypotheses (Quantitative vs. Qualitative) | 19.1 |


# List of Figures


| Sl. No | Particular | Figure No |
|---|---|---|
| 1 | Contribution by Repository | 8.1 |
| 1 | Conceptual Model | 12.1 |
| 2 | Construction of Questionnaire | 13.1 |
| 3 | Hypotheses Mapping | 15.1 |

# 1. Introduction

Waste management is one of the oldest practices used to ensure urban sanitation and public health. In ancient times, societies such as the Greeks and Romans established rudimentary systems to manage waste, believing that keeping streets clean would prevent the spread of diseases. Evidence suggests that these early urban civilizations prioritized waste removal, particularly to avoid contaminating drinking water sources and living areas. The Romans, for instance, built the Cloaca Maxima, a monumental sewage system designed to drain marshes and carry waste out of sight. This was one of the earliest examples of engineered infrastructure specifically designed to control waste and improve urban sanitation. Although primitive by modern standards, these systems were foundational in shaping how waste was managed in urban environments and laid the groundwork for later advancements (Amasuomo & Baird, 2016).

The Industrial Revolution in the 18th and 19th centuries marked a pivotal moment in the history of waste management. Rapid urbanization and the growth of industrial activities resulted in an unprecedented increase in waste production. Cities were overwhelmed by the amount of waste generated, necessitating more sophisticated waste disposal systems. The 19th century saw technological innovations such as watertight garbage cans and improved waste collection vehicles, allowing cities to better combat sanitation issues. The invention of the first refuse incinerator in 1874 revolutionized waste disposal by reducing the volume of waste and generating energy. This was a significant milestone, marking the transition from traditional waste disposal methods to more advanced technologies (Sandhu, 2014). Moreover, this period laid the foundation for modern waste management practices by introducing organized waste collection services, incineration, and sanitary landfills, which became common by the early 20th century.

The emergence of the "3Rs" (Reduce, Reuse, Recycle) in the mid-20th century represented a paradigm shift in how waste was viewed and managed. This concept emphasized the importance of reducing waste generation, reusing materials wherever possible, and recycling waste to minimize the environmental impact. The introduction of the 3Rs became a cornerstone of modern waste management strategies, promoting sustainability and resource conservation. Over time, governments around the world began integrating these principles into their waste management policies, leading to widespread adoption of recycling programs,

composting, and resource recovery systems (Guerrero, Maas, & Hogland, 2015). These efforts were supported by advancements in materials recovery facilities, enabling more efficient sorting and processing of waste.

International agreements such as the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes, adopted in 1989, played a significant role in shaping global waste management policies. The Basel Convention aimed to prevent the export of hazardous waste to developing countries, ensuring that hazardous materials were managed in an environmentally sound manner. This convention has been instrumental in reducing the generation of hazardous waste and promoting safer disposal practices, particularly in regions lacking the infrastructure to handle such materials. As global trade and waste production continue to increase, the Basel Convention remains a critical framework for regulating hazardous waste movements and fostering international cooperation on waste management (Taelman et al., 2018).

In recent years, waste management has entered a new era with the advent of technological innovations such as artificial intelligence (AI), the Internet of Things (IoT), and smart waste management systems. These technologies have significantly enhanced the efficiency and sustainability of waste management practices. AI is increasingly used in waste sorting facilities to improve the accuracy and speed of material recovery, helping to reduce contamination in recycling streams. IoT-enabled waste management systems allow real-time monitoring of waste levels in bins, optimizing collection routes and reducing operational costs. Additionally, these technologies contribute to reducing greenhouse gas emissions by streamlining waste collection processes and ensuring that waste is disposed of or recycled more efficiently (Abdallah et al., 2020). As cities continue to grow and waste generation increases, the integration of AI and IoT into waste management systems is seen as a critical step toward achieving sustainability and minimizing the environmental footprint of urban waste.

The waste management has evolved from basic practices in ancient civilizations to complex, technology-driven systems designed to manage modern waste challenges. The combination of historical developments, such as the introduction of sanitary landfills and incinerators, with contemporary innovations like AI and IoT, has transformed waste management into a more efficient and sustainable process.

## 2.Waste Management in Hill Stations

Hill stations, renowned for their natural beauty and tourism, face complex challenges in managing waste due to their geographical and ecological characteristics. These regions often serve as major tourist destinations, and the seasonal influx of visitors drastically increases waste generation. The high volume of waste generated during peak tourism seasons overwhelms local infrastructure, leading to improper disposal methods such as open dumping and unregulated incineration. These practices result in significant environmental degradation, including soil contamination, water pollution, and habitat destruction in ecologically fragile areas. The combination of limited infrastructure, steep terrain, and difficult access routes complicates waste collection and transportation, further aggravating the issue (Kumar et al., 2017).

From a global perspective, hill stations in developed countries have adopted advanced waste management systems to mitigate the impact of tourism on the environment. For instance, in Switzerland, a country known for its pristine mountain landscapes, waste management strategies focus on recycling, composting, and energy recovery through waste-to-energy plants. Switzerland also emphasizes waste prevention, encouraging tourists to minimize their waste generation. In the Swiss Alps, innovative methods such as cable car systems are employed to transport waste from remote areas to collection points in the valleys, making waste management more efficient in hard-to-reach areas (Steiner et al., 2016).

In developing countries, the situation is more challenging. For example, in Nepal's Everest region, the significant increase in trekking tourism has resulted in an accumulation of waste, which is difficult to manage due to the region's high altitude and remoteness. However, local authorities have introduced innovative community-led initiatives to combat this issue. The Sagarmatha Pollution Control Committee (SPCC) is responsible for collecting, recycling, and properly disposing of waste, while strict penalties are imposed on trekkers and mountaineers who fail to adhere to waste management protocols. Such initiatives underscore the importance of community involvement in sustainable waste management practices (Thapa et al., 2020).

In the Indian context, hill stations such as Shimla, Darjeeling, and Manali are popular tourist destinations, and they face similar waste management challenges. These regions experience an overwhelming surge in waste during peak tourist seasons, leading to improper disposal practices that affect the local environment. In Darjeeling, which has long struggled with solid waste management issues, the local government has implemented waste segregation and composting programs, but challenges such as inadequate infrastructure and public participation remain prevalent. Similarly, Shimla's municipal corporation has adopted door-to-door waste collection and recycling programs, but the rugged terrain and narrow roads make waste transportation difficult (Yadav et al., 2016).

Kerala, known for its lush green landscapes and popular hill stations like Munnar and Wayanad, faces considerable challenges in managing tourism-driven waste. In Munnar, the high influx of tourists has led to a significant increase in waste generation, which has overwhelmed the local waste management system. The state government of Kerala has implemented several waste management policies, such as the Kerala Municipality Solid Waste Management Rules, 2009, and the Kerala Plastic Waste Management Rules, 2016. These regulations aim to promote the segregation, collection, and scientific disposal of waste. Munnar's "Green Munnar" project, which involves collaboration between local authorities, hotels, and communities, focuses on reducing plastic waste, promoting recycling, and educating tourists about responsible waste disposal. However, the terrain and limited infrastructure continue to be barriers to effective waste management in this region (Government of Kerala, 2019).

Wayanad faces similar challenges, exacerbated by a lack of waste treatment facilities and insufficient community participation. Local authorities have adopted community-based waste management programs that emphasize composting organic waste and segregating recyclables. However, the effectiveness of these programs is limited by logistical issues, such as the inaccessibility of some areas due to the steep terrain, and the lack of continuous funding to maintain infrastructure. Moreover, tourism in Wayanad, particularly eco-tourism, has intensified the need for sustainable waste management practices. The state government has recognized the importance of eco-friendly tourism and has made efforts to integrate sustainable waste management into tourism policies, with some success (Singh & Dev, 2021).

A sharp increase in waste generation during peak tourist seasons, coupled with limited infrastructure, makes effective waste management a critical issue. The following table illustrates waste generation and disposal statistics for Kerala's hill stations, showcasing the scope of the problem.

**Table 1.1** *Overview of Kerala's Waste Management*

| **Parameter** | **Value** |
|---|---|
| Total Waste Generation (TPD) | 10,505 |
| Urban Waste Generation (TPD) | 3,472 |
| Rural Waste Generation (TPD) | 7,032 |
| Biodegradable Waste (%) | 77% |
| Non-Biodegradable Waste (%) | 18% |
| Insert Wastes (%) | 5% |
| Total Households with Haritha Karma Sena Service | 46 Lakh |
| Biodegradable Waste Treated (%) | 75% |

*Source: (Suchitwa Mission, 2021)*

# 3. Research Questions

1. What are the gaps in policy implementation, and how do they affect waste management practices in selected hill stations of Kerala?
2. How do gaps in policy implementation influence community engagement and perception?
3. To what extent have local and regional policies influenced waste management practices?
4. How does community engagement contribute to the effectiveness of waste management practices?
5. How do policy frameworks affect the environmental and sustainability outcomes of waste management practices?
6. What are the environmental and sustainability outcomes of current waste management practices?
7. How does community engagement improve the sustainability and environmental outcomes of waste management practices?

8. Does community engagement in waste management practices differ significantly across different age groups?
9. How do demographic factors such as educational qualification and income group influence perceptions of policy implementation gaps in waste management practices?
10. What is the relationship between policy implementation gaps and the influence of policies in the context of waste management practices?
11. What is the role of local businesses in waste management and promoting sustainability?

## 4. Research Objectives

1. To identify gaps in policy implementation and examine their impact on waste management practices.
2. To assess the influence of policy implementation gaps on community engagement and perception.
3. To evaluate the influence of local and regional policies on waste management practices,
4. To analyze the role of community engagement in improving waste management practices.
5. To examine the effect of policy frameworks on the environmental and sustainability outcomes of waste management practices.
6. To analyze the environmental and sustainability impacts of current waste management practices.
7. To assess the contribution of community engagement to sustainability and environmental outcomes,
8. This study aimed to examine variations in community engagement in waste management practices across different age groups.
9. To examine the effect of demographic factors such as educational qualifications and income on perceptions of policy implementation gaps in waste management practices.
10. To investigate the relationship between gaps in policy implementation and the perceived influence of waste management policies,
11. This study aimed to examine how local businesses help with waste management and what they think about promoting sustainability.

## 5. Scope of the Study

This research is about the waste management practices in the major hill stations of Wayanad and Idukki districts in Kerala. The core aim is to understand how well local and regional waste management policies are put in place and how effectively they are managing waste in these tourist places. Hill stations have various problems in managing the waste due to various reasons such as their steep hills, weak environment, and the huge number of tourist arrival during holidays.

Along with that, the study makes and attempt to understand the perception of local people about waste management, how local business operators are helping in waste management and their perception about promoting sustainability in the region.

## 6. Structure of the Thesis

1. **Chapter 1**

   **Introduction**: Provides background, objectives, and research questions, including the importance of waste management in hill stations and also highlights the limitations of this study and provides and overview of chapter schemes followed in this entire study.

2. **Chapter 2**

   **Literature Review**: This chapter reviews existing studies, policies, and best practices related to waste management in hill stations, including Kerala's current policies. After a careful review of the literature, a research gap is identified. The study will move forward based on this gap to explore new findings.

3. **Chapter 3**

   **Conceptual Model and Hypotheses**: This chapter develops a conceptual framework to study waste management practices, policies, and community involvement. It clearly defines the key variables and items for analysis. These form the base for the next steps in the research process.

4. **Chapter 4**

   **Research Methodology**: This chapter outlines the research design using both quantitative surveys and qualitative interviews. Data are collected from key stakeholders through purposive sampling. A pilot study validates the tools. Quantitative data are analysed statistically, while qualitative data are examined thematically to study waste management in hill stations.

5. **Chapter 5**

   **Study Area Profile**: This chapter describes the geographical features, population details, and socio-economic conditions of Kerala's hill stations. It covers terrain, climate, local livelihoods, and tourism trends that influence waste generation and management in these regions.

6. **Chapter 6**

   **Data Analysis and Interpretation**: This chapter analyses data to assess waste practices, policy impact, and environmental effects. It includes statistical tests, factor analysis, and thematic analysis of stakeholder views. Ten Hypotheses are tested to explore links between policy gaps, community engagement, and sustainability in Kerala's hill stations.

7. **Chapter 7**

   **Findings and Recommendations**: This chapter summarizes key findings, gives practical recommendations for improving waste management, and suggests directions for future research in Kerala's hill stations.

# 7. Limitations of the Study

1. The study focuses only on selected hill stations in Kerala, so findings may not apply to other hill stations.
2. Data collection depends on the willingness of stakeholders to take part in surveys and interviews, which may cause sampling bias.
3. Seasonal changes in tourist flow can affect the amount, type, and management of waste observed during the study.
4. The study does not offer a wide comparison between Kerala's waste management policies and those of other states or countries.

# 8. Review of Literature

### 8.1 Introduction

Waste management is a critical global challenge shaped by rapid urbanization, industrialization, and population growth. Developed countries like Japan, Germany, and Sweden have implemented advanced systems that prioritize waste segregation, recycling, and waste-to-energy (WTE) technologies. Japan's stringent policies have achieved recycling rates above 80%, underscoring the importance of strict regulatory enforcement, technological integration, and community compliance (Chen et al., 2016). Conversely, developing nations

like India face challenges due to resource constraints, socio-economic disparities, and weak infrastructure, leading to unscientific practices such as open dumping and burning, which harm public health and the environment (Priti & Mandal, 2019).

### 8.2 Waste Management in India

India generates 120,000 metric tons of municipal solid waste daily, of which only 30% is scientifically processed (Kumar et al., 2017). The **Solid Waste Management Rules (2016)** and initiatives like the **Swachh Bharat Abhiyan** provide a framework for segregation, recycling, and sustainable disposal. However, weak enforcement, resource limitations, and lack of technical expertise hinder their implementation, especially in rural and hilly regions (Prakasam & Das, 2016). Despite these limitations, Kerala's decentralized model stands out for integrating community participation with localized solutions.

### 8.3 Kerala's Decentralized Approach

Kerala's **Haritha Keralam Mission** and the **Green Protocol** have introduced progressive practices such as waste segregation at the source, household-level composting, and reduced reliance on centralized systems (Prakasam & Das, 2016). Community-led initiatives like **Kudumbashree**, a women-led self-help group network, have proven effective in promoting waste segregation and composting. However, these successes are unevenly distributed, with hill regions and marginalized areas facing logistical and socio-economic challenges that limit the scalability of these models (Kaithery & Karunakaran, 2019). Additionally, policies often fail to account for local socio-cultural dynamics and geographical complexities, adopting a one-size-fits-all approach (Kumar & Satheesh, 2021).

### 8.4 Challenges in Hill Stations and Rural Areas

Hill stations in Kerala, such as Neyyatinkara, face unique challenges due to rugged terrain, seasonal tourist influx, and limited infrastructure. Studies show that collection efficiency remains below 50%, with open dumping and burning as prevalent disposal methods (Prakasam & Das, 2016). The absence of tailored policies exacerbates these issues, as current frameworks fail to address the logistical complexities and environmental sensitivity of such regions (Subramoniam & Suresh, 2015). Furthermore, while community participation is emphasized in Kerala's waste management policies, its implementation is inconsistent in remote and hilly areas due to socio-economic exclusion and lack of awareness.

### 8.5 Role of Community Participation and Awareness

Community involvement is pivotal for sustainable waste management, as demonstrated by Kerala's **Kudumbashree** and global examples like waste banks in Indonesia and recycling hubs in Malaysia. While awareness campaigns such as the **Swachh Bharat Abhiyan** have increased public knowledge about waste segregation, they often fail to translate into sustained behavioral change, particularly in rural regions (Mavila & Francis, 2019). Studies highlight the importance of localized, culturally relevant educational initiatives to improve public participation in waste segregation and composting (Kaithery & Karunakaran, 2019).

### 8.6 Technological Innovations in Waste Management

Technological advancements such as **IoT-enabled monitoring**, **GIS-based route optimization**, and **AI-driven sorting** have shown potential to improve waste management efficiency. For example, **Shimla** has implemented IoT-based smart bins to optimize waste collection routes and reduce costs (Pal & Bhatia, 2021). Similarly, Kerala has explored WTE technologies for organic and non-recyclable waste, but high costs and technical expertise requirements limit their adoption (Subha, 2019). Additionally, advanced systems like **blockchain for waste traceability** and **AI for material recovery** remain underutilized in the Indian context due to financial and operational barriers (Mukherjee et al., 2021).

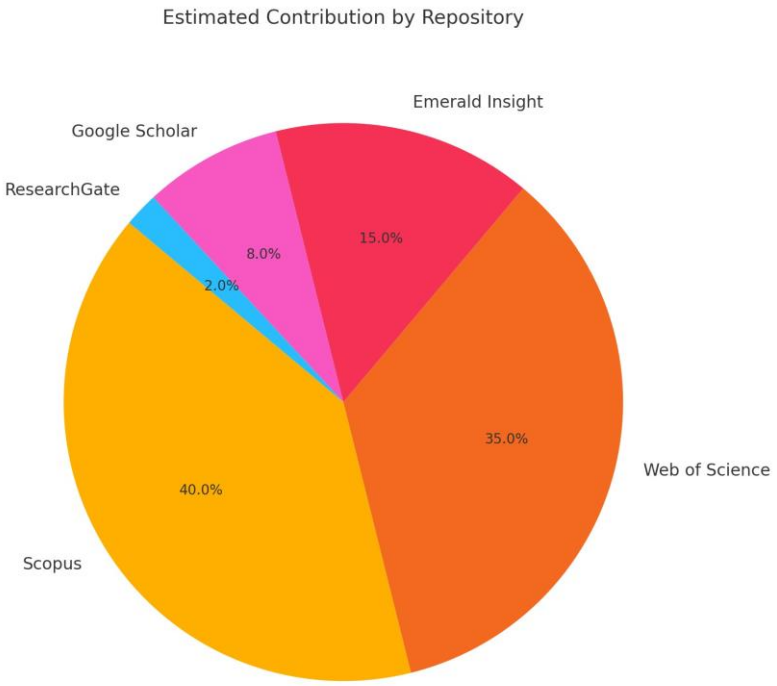



*Figure 8.1 Contribution by Repository*

# 9. Statement of the Problem

### 9.1 Table showing Research Gap, Research Objective, Research Questions Mapping

| Research Objective (RO) | Aligned Research Question (RQ) | Aligned Research Gap (RG) |
|---|---|---|
| To identify gaps in policy implementation and examine their impact on waste management practices. | What are the gaps in policy implementation, and how do they affect waste management practices? | RG1: Disconnect Between Policy Formulation and Implementation *(Prakasam & Das, 2016)* RG5: Challenges in Managing Specific Waste Streams *(Benny, 2022; Ragossnig & Agamuthu, 2021; Hossain et al., 2022; Mykhailenko et al., 2023)* |
| To assess the influence of policy implementation gaps on community engagement and perception. | How do gaps in policy implementation influence community engagement and perception? | RG1: Disconnect Between Policy Formulation and Implementation *(Prakasam & Das, 2016)* RG3: Limited Effectiveness of Community Education Campaigns *(Kaithery & Karunakaran, 2019)* |
| To evaluate the influence of local and regional policies on waste management practices. | To what extent have local and regional policies influenced waste management practices? | RG2: Failure to Address Unique Local Challenges *(Kumar & Satheesh, 2021)* |
| To analyze the role of community engagement in improving waste management practices. | How does community engagement contribute to the effectiveness of waste management practices? | RG3: Limited Effectiveness of Community Education Campaigns *(Kaithery & Karunakaran, 2019)* RG4: Limited Role of Community Participation *(Menon & Palackal, 2021)* |
| To examine the effect of policy frameworks on the environmental and sustainability outcomes of waste management | How do policy frameworks affect the environmental and sustainability outcomes of waste management | RG5: Challenges in Managing Specific Waste Streams *(Benny, 2022; Ragossnig & Agamuthu, 2021; Hossain et al., 2022; Mykhailenko et al., 2023)* |

| | | |
|---|---|---|
| practices. | practices? | |
| To analyze the environmental and sustainability impact of current waste management practices. | What are the environmental and sustainability outcomes of current waste management practices? | RG5: Challenges in Managing Specific Waste Streams *(Benny, 2022; Ragossnig & Agamuthu, 2021; Hossain et al., 2022; Mykhailenko et al., 2023)* |
| To assess the contribution of community engagement to sustainability and environmental outcomes. | How does community engagement improve the sustainability and environmental outcomes of waste management practices? | RG4: Limited Role of Community Participation *(Menon & Palackal, 2021)* |
| To study variations in community engagement in waste management practices across different age groups. | Does community engagement in waste management practices differ significantly across different age groups? | RG4: Limited Role of Community Participation *(Menon & Palackal, 2021)* |
| To examine the effect of demographic factors such as educational qualification and income on perceptions of policy implementation gaps. | How do demographic factors such as educational qualification and income group influence perceptions of policy implementation gaps? | RG6: Influence of Demographic and Socio-Economic Factors *(Adebuason, 2024; Khan et al., 2018)* |
| To investigate the relationship between gaps in policy implementation and the perceived influence of waste management policies. | What is the relationship between policy implementation gaps and the influence of policies in the context of waste management practices? | RG1: Disconnect Between Policy Formulation and Implementation *(Prakasam & Das, 2016)* |
| To understand how local businesses help with waste management and what they think about promoting sustainability. | What is the role of local businesses in waste management and promoting sustainability? | RG7: Limited Role of Local Business Vendors in Waste Management *(Grangxabe et al., 2024; Mtema, 2016)* |

# 10. Sources of Literature

- ***Major repositories include:***
    - ✓ Scopus
    - ✓ Web of Science
    - ✓ Emerald Insight
    - ✓ Google Scholar
    - ✓ ResearchGate
- ***Additional sources:***
    - ✓ Local government reports
    - ✓ National regulatory frameworks like SWM Rules, 2016
    - ✓ Specialized environmental and engineering platforms
    - ✓ Grey literature, including white papers and organizational reports

## 10.1 Key Themes

The major themes of the literature include Municipal Solid Waste Management (MSWM), which covers challenges and best practices in managing municipal waste. Decentralized Waste Management is another focus area, emphasizing community-based models for efficient local-level waste handling. Integrated Waste Management, which involves a holistic approach to combining various waste treatment strategies, is also a significant area of study. Additionally, Waste-to-Energy Technologies, which explore methods to convert waste into energy, form a key part of the research themes.

Other focus areas include Plastic and E-Waste Management, highlighting the challenges of managing non-biodegradable and electronic waste. Community-driven waste models, which analyze the role of local participation in waste management, are also explored. The literature further addresses Kerala-specific waste management policies, such as the Haritha Keralam Mission and the Green Protocol, alongside the principles of a circular economy and Sustainable Development Goals (SDGs). Environmental impacts of waste and Biomedical Waste Management also form crucial components of the research.

**Inclusion Criteria**

Included Literatures that are,

- Relevant to waste management topics like MSWM, plastic waste, e-waste, etc.
- Peer-reviewed articles, conference papers, or credible reports.
- Focused on India (Kerala) or global comparisons.

- Published within the last 10–15 years.
- Methodologically rigorous with measurable outcomes.

**Exclusion Criteria**

Excluded Literatures that are,

- Irrelevant to waste management or research scope.
- Unverified or non-credible sources.
- Published over 15 years ago (unless seminal).
- Lacking methodology or presenting incomplete/unreliable data.

## 11. Research Methodology

A structured research methodology used to explore waste management practices in selected hill stations of Wayanad and Idukki in Kerala. The study adopted an explanatory sequential mixed-methods approach, combining both quantitative and qualitative research to ensure comprehensive insights. Initially, quantitative data were gathered using structured questionnaires administered to local residents. This phase identified general patterns and community perceptions regarding waste policy and practices.

Following this, qualitative data were collected through structured interviews and focus group discussions with local business owners and service providers, offering deeper insights into challenges, experiences, and operational views related to waste management. Purposive sampling was used to select interview participants with at least three years of experience. Data collection ceased upon reaching saturation, ensuring all major views were captured.

The quantitative data were analysed using SPSS, employing descriptive statistics (mean, standard deviation, frequency) and inferential tests including T-tests, ANOVA, and regression analysis to assess group differences and relationships. The qualitative data were analysed using thematic analysis following Braun and Clarke's six-step process, ensuring meaningful pattern identification and contextual understanding.

The questionnaire's validity was confirmed through face, content, and construct validation, while reliability was confirmed via Cronbach's alpha (value = 0.87). A pilot test with 50 respondents further refined the tool. Ethical standards were upheld, including informed consent, confidentiality, and secure data handling.

This mixed-methods approach allowed for triangulation of findings, enhancing the study's credibility. Quantitative data provided measurable outcomes on public participation and policy impact, while qualitative data explained the underlying attitudes and implementation

barriers. Together, this methodology ensured a robust and holistic understanding of waste management issues in Kerala's hill stations.

# 12 Conceptual model

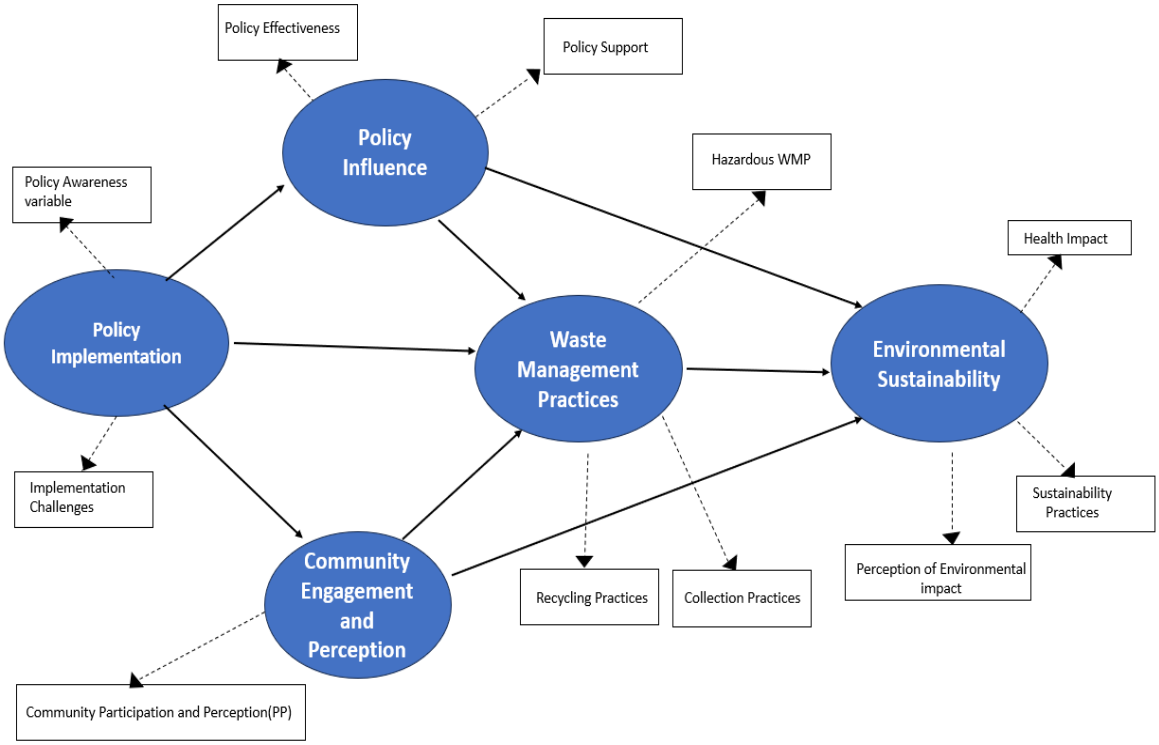



*Figure 12.1 Conceptual Model*

This conceptual model represents a framework to study the waste management practices of rail stations in Kerala, incorporating a policy implementation approach. Below is a brief explanation of its components and relationships:

### 8.1 Key Components:

1. **Policy Influence**:
    - Represents the role of policies in shaping waste management practices.
    - Factors such as **policy effectiveness** and **policy support** determine the extent to which policies are implemented and enforced.
2. **Gaps in Policy Implementation**:
    - Highlights the challenges and shortcomings in executing waste management policies.
    - Includes variables like **policy awareness** and **implementation challenges**, which affect the overall success of policy-driven waste management.

3. **Community Engagement and Perception**:
    - Focuses on the involvement and perception of the community in waste management activities.
    - **Community participation and perception (PP)** play a critical role in bridging gaps in implementation and ensuring effective waste management.
4. **Waste Management Practices**:
    - Central to the model, these include activities such as **recycling practices** and **collection practices** that form the operational core of waste management.
5. **Environmental Sustainability:**
    - Examines the broader outcomes of waste management, including **health impacts**, **sustainability practices**, and the **perception of environmental impact**.

This model serves to analyse how effective policies, community involvement, and operational practices contribute to sustainable waste management at rail stations in Kerala. It also identifies critical challenges and provides insights into enhancing policy implementation for better outcomes.

This framework is intended to provide a holistic understanding of the interactions between policy, community, operational practices, and sustainability in the context of waste management.

## 13. Construction of Questionnaire

**The diagram clearly illustrates the construction of Research Tool, i.e. questionnaire**

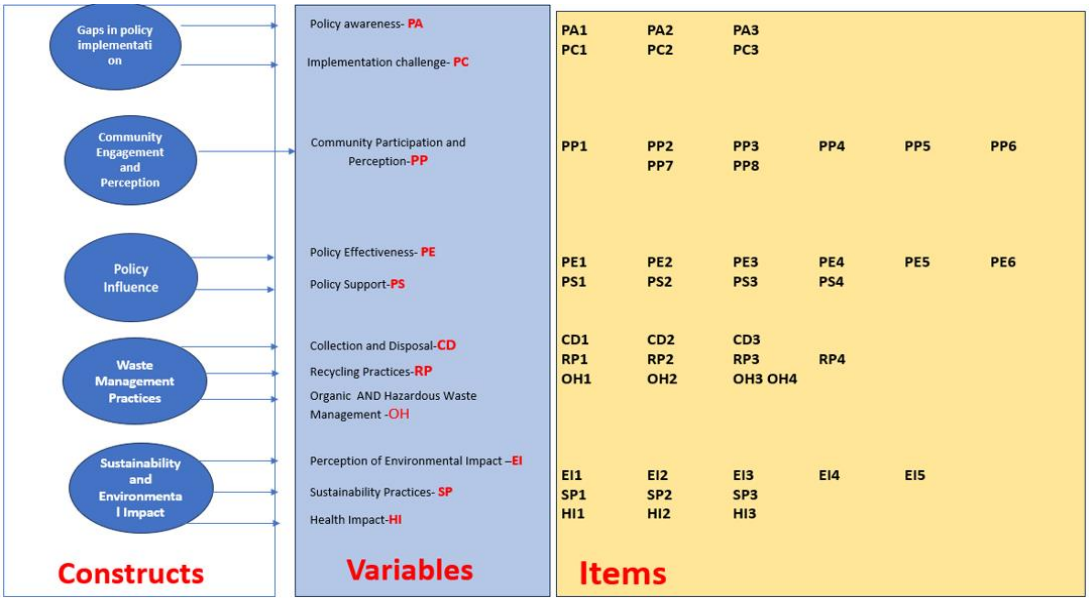



*Figure 13.1 Construction of Questionnaire*

# 14. Theocratical background

**Gaps in Policy Implementation**

The issue of gaps in policy implementation is explained through Sabatier and Mazmanian's Policy Implementation Framework and the Top-Down and Bottom-Up Approaches. These frameworks emphasize the importance of stakeholder involvement and highlight local challenges that hinder the effective implementation of policies. This concept is supported by the works of Sabatier and Mazmanian (1980) and Hill and Hupe (2002).

**Policy Influence**

Policy influence is examined using New Institutionalism and the Collaborative Governance Model. These theories focus on how institutions and multi-stakeholder collaboration contribute to shaping effective policy outcomes. This component underscores the importance of institutional dynamics and governance strategies, as discussed by March and Olsen (1984) and Ansell and Gash (2008).

**Waste Management Practices**

Waste management practices are framed by the Integrated Sustainable Waste Management (ISWM) Framework and the Circular Economy Model. These frameworks address the technical, social, and environmental aspects of waste management, emphasizing the importance of recycling and resource efficiency. The works of Wilson et al. (2001) and the Ellen MacArthur Foundation (2013) provide key insights into these approaches.

**Community Engagement and Perception**

Community engagement and perception are analyzed through Arnstein’s Ladder of Citizen Participation and the Theory of Planned Behavior (TPB). These theories explore how community participation, attitudes, and norms influence waste management practices such as recycling. Arnstein (1969) and Ajzen (1991) contribute significant theoretical grounding for this component.

**Sustainability and Environmental Impact**

The sustainability and environmental impact of waste management are explained using the Triple Bottom Line (TBL), Ecological Modernization Theory, and Sustainability Science Framework. These theories highlight the interconnected environmental, social, and economic dimensions of sustainability. Foundational works by Elkington (1998), Mol and Sonnenfeld (2000), and Kates et al. (2001) provide comprehensive insights into these dimensions.

**Health Impact (Environmental)**

The environmental health impact of waste management is examined through the Environmental Health Risk Framework. This framework establishes the connection between hazardous waste management practices and public health risks. Key contributions by Briggs (2003) and WHO (2010) provide a basis for understanding the critical health implications of improper waste management.

# 15. Development of Hypotheses

This study examined five key ideas: Gaps in Policy Implementation, Policy Influence, Waste Management Practices, Community Engagement and Perception, and Sustainability and Environmental Impact. These ideas were taken from past studies and combined to create a new model. The model shows how each idea affects the others and how they together influence waste management outcomes. Studies have shown that weak policy use can damage the working of waste systems. On the other hand, strong policy support and public trust improve behaviour and protect the environment. Based on these insights and missing points in earlier research, this study has developed the following Hypotheses.

***H1***-There is a significant relationship between gaps in policy implementation and policy influence.

***H2***-Gaps in policy implementation significantly reduce the effectiveness of waste management practices.

***H3***- Policy implementation gaps have a significant impact on community engagement and perception in waste management practices.

***H4***- There is a significant correlation between the policy influence and the waste management practices.

***H5***- There is a significant correlation between community engagement and perception and waste management practices.

***H6***- Policies influence have a significant influence on the Sustainability of Environment

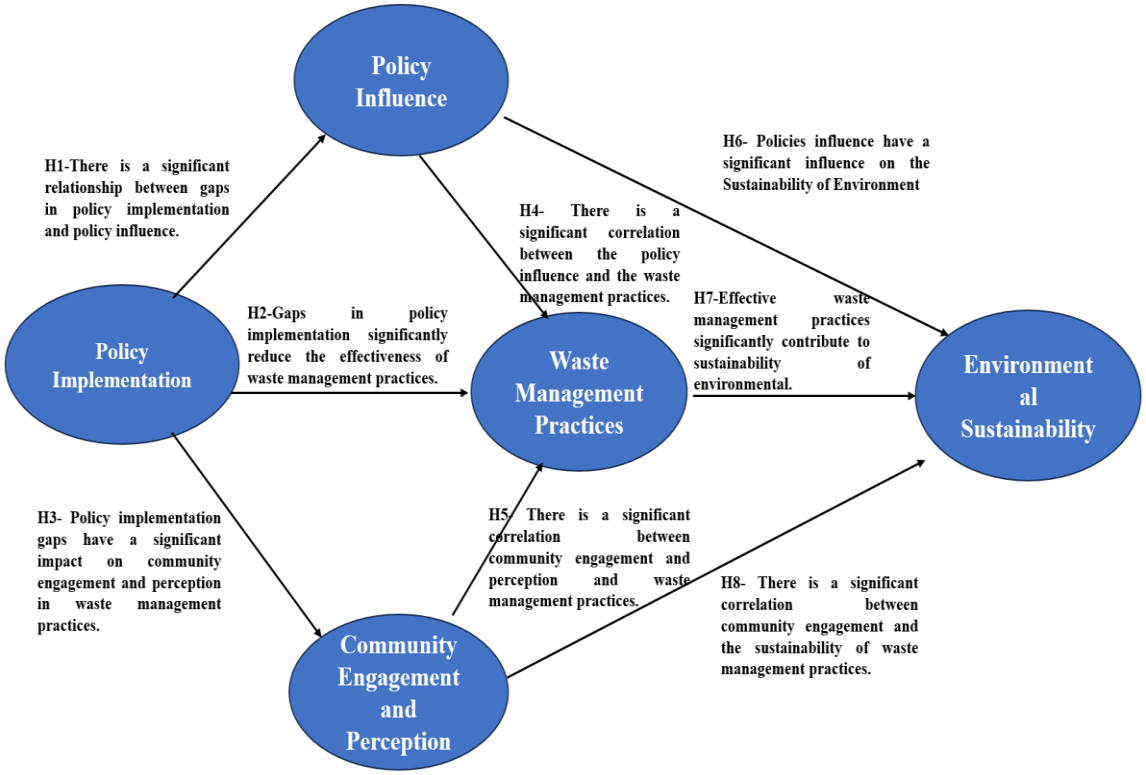
***H7***-Effective waste management practices significantly contribute to sustainability of environmental.

***H8***- There is a significant correlation between community engagement and the sustainability of waste management practices.

***H9:*** Community engagement in waste management practices differs significantly based on age groups.

***H10:*** Demographic variables such as educational qualification and income group significantly influence perceptions of policy implementation gap.

***Figure 15.1*** *Hypotheses Mapping*


Policy Influence
H1-There is a significant relationship between gaps in policy implementation and policy influence.
H6- Policies influence have a significant influence on the Sustainability of Environment
H4- There is a significant correlation between the policy influence and the waste management practices.
Policy Implementation
H2-Gaps in policy implementation significantly reduce the effectiveness of waste management practices.
H7-Effective waste management practices significantly contribute to sustainability of environmental.
Waste Management Practices
Environmental Sustainability
H3- Policy implementation gaps have a significant impact on community engagement and perception in waste management practices.
H5- There is a significant correlation between community engagement and perception and waste management practices.
H8- There is a significant correlation between community engagement and the sustainability of waste management practices.
Community Engagement and Perception

After the development of Conceptual model and Research Hypotheses the Hypotheses mapping has been developed, that shows how the Hypotheses are aligned with the conceptual model.

## 16. Relevance of Constructs

1. **Community Engagement (PP)**

   Community engagement is vital for fostering effective waste management practices. Studies have shown that community involvement enhances the efficiency and sustainability of waste management systems. For instance, research in Lusaka, Zambia, demonstrated that increasing community participation improved household waste segregation and reduced reliance on centralized waste management (Chisanga et al., 2024). Similarly, findings in Indonesia emphasize the role of education and training in increasing participation and reducing waste production (Tarigan et al., 2020). Community engagement is particularly relevant in Kerala, where mobilizing communities has historically contributed to effective waste practices.

2. **Policy Effectiveness (PE)**

   Policy effectiveness determines the success of waste management systems by ensuring that regulations and frameworks are practical and enforceable. A study in Tanzania highlighted that the success of policies depends on the support of local governments and community-based organizations (Mlozi, 2011). Additionally, in Bangalore, India, local policy interventions that prioritized community input significantly improved waste collection and recycling rates (Kumar & Nandini, 2013). Policy effectiveness is directly tied to Kerala's ability to implement strategies suited to its geographical and socio-economic context.

3. **Waste Management Practices (RP, CD, OH)**

   Effective waste management practices, such as recycling, composting, and proper collection systems, are essential for minimizing environmental harm. Research in Fiji highlighted that improper waste management behaviors, such as indiscriminate dumping, could be mitigated through awareness campaigns and improved recycling infrastructure (Sewak et al., 2021). Similarly, a study in Indonesia emphasized that the adoption of composting and recycling practices reduced landfill waste and encouraged resource efficiency (Pratama et al., 2021). These practices align with Kerala's need for innovative approaches to address waste generation in hill stations.

4. **Sustainability Practices (SP)**

   Sustainability practices focus on reducing environmental footprints while ensuring long-term benefits. Research in Zambia highlighted the role of sustainability-oriented waste management practices in improving recycling rates and promoting the use of renewable resources (Mutobe et al., 2022). Additionally, studies in urban India demonstrated that sustainability practices, such as waste segregation at source, resulted in significant reductions in landfill dependency (Ahmed et al., 2024). Encouraging sustainability practices in Kerala can aid in balancing the region's environmental sensitivity with waste management needs.

5. **Environmental Impact (EI)**

   The environmental impact of waste management practices is a critical consideration, particularly in ecologically sensitive regions like Kerala. A study in Fiji emphasized that poor waste management behaviors, such as inadequate segregation and open dumping, significantly contributed to environmental degradation (Sewak et al., 2021). Research in Indonesia further highlighted that awareness campaigns on recycling and waste reduction effectively minimized harmful practices (Pratama et al., 2021).

Addressing the environmental impacts of waste management in Kerala's hill stations is vital for preserving the region's biodiversity and reducing pollution.

6. **Gaps in Policy Implementation (PA, PC)**

   Gaps in policy implementation can hinder waste management progress and sustainability outcomes. Studies in Zambia and India revealed that incomplete implementation of waste management policies often results from a lack of coordination between stakeholders and inadequate community involvement (Chisanga et al., 2024), (Ahmed et al., 2024). Bridging these gaps through effective policy implementation can drive the success of waste management systems in Kerala, especially in addressing the unique challenges of hill stations.

# 17 . Data analysis and interpretation

### 17.1 Introduction to Analytical Framework

This chapter focused on the systematic analysis and interpretation of data gathered from 407 respondents to assess the effectiveness and gaps in waste management practices across selected hill stations of Kerala. The analysis employed both **descriptive** and **inferential** statistical methods, ensuring validity, reliability, and interpretability of results in line with the study's research objectives.

Statistical tools used included **SPSS 23.0** and **AMOS**, and standard significance level was set at $\mathbf{p < 0.05}$. A stepwise approach was used—starting with descriptive profiling, followed by reliability and normality testing, and then inferential statistics such as correlation, regression, and ANOVA.

### 17.2 Descriptive Statistics Overview

Descriptive statistics were used to summarize demographic data and key variables using means, standard deviations, frequencies, and percentages:

- **Gender**: 53.3% male, 46.7% female
- **Age Distribution**: Majority (31.2%) were aged 36–45 (M = 2.42, SD = 1.02)
- **Income**: 38.3% earned ₹10,000–₹25,000 (M = 2.38, SD = 1.20)
- **Education**: 33.9% studied above metric but below graduation (M = 2.24, SD = 0.96)
- **Living Area**: 68.6% lived in rural areas (M = 1.69, SD = 0.46)

This demographic spread highlighted a rural-dominated sample with modest education and income, making it ideal for studying community-level policy impact and waste practices.

### 17.3 Reliability and Normality

- **Cronbach's Alpha** values for constructs ranged from **0.731 to 0.907**, indicating high internal consistency.
- Normality of key variables (e.g., Environmental Impact and Waste Management Practices) was confirmed via the **Kolmogorov-Smirnov test** ($p = 0.200$), justifying the use of parametric tests in inferential analysis.

### 17.4 Hypothesis Testing Result

Table 17.1 Hypothesis Testing Result

| Hyp. No. | Statement | Statistical Method | p-value / Test Result | Status |
|---|---|---|---|---|
| **H1** | Policy gaps and policy influence | Pearson Correlation | $r = 0.080$, $p = 0.107$ | Not Significant ($H_0$ retained) |
| **H2** | Policy gaps and waste management practices | Correlation & Regression | $r = 0.823$, $p < 0.001$; $R^2 = 0.677$ | Significant ($H_0$ rejected) |
| **H3** | Policy gaps and community engagement | Correlation & Regression | $r = 0.053$, $p = 0.144$; $R^2 = 0.003$ | Not Significant ($H_0$ retained) |
| **H4** | Age and community engagement variation | ANOVA | $F = 0.451$, $p = 0.718$ | Not Significant ($H_0$ retained) |
| **H5** | Education and perception of policy gaps | Chi-Square Test | $\chi^2 = 33.646$, $p = 0.000$ | Significant ($H_0$ rejected) |
| **H6** | Income and perception of policy gaps | Chi-Square Test | $\chi^2 = 57.233$, $p = 0.000$ | Significant ($H_0$ rejected) |
| **H7** | Vendors' role in waste management | Regression | $\beta = 0.774$, $t = 26.489$, $p < 0.001$; $R^2 = 0.599$ | Significant ($H_0$ rejected) |
| **H8** | Community engagement and sustainability | Regression | $\beta = 0.839$, $t = 36.021$, $p < 0.001$; $R^2 = 0.705$ | Significant ($H_0$ rejected) |
| **H9** | Waste practices and environmental outcomes | Regression | $\beta = 0.763$, $t = 25.137$, $p < 0.001$; $R^2 = 0.582$ | Significant ($H_0$ rejected) |
| **H10** | Age group difference in engagement in waste practices | ANOVA | $F = 0.451$, $p = 0.718$ | Not Significant ($H_0$ retained) |

# 18. Thematic Analysis and Interpretation

## 18.1 Thematic Analysis Framework

The qualitative part of the study used **Clarke and Braun's (2006) six-phase thematic analysis** to examine the views of business owners on waste management in Kerala's hill stations. Through careful coding, pattern recognition, and interpretation, nine major themes were developed based on repeated readings and coding of interview transcripts.

## 18.2 Key Themes Emerged

- **Theme 1: Duration of Business and Experience**
  Long-term businesses observed a shift to more organized waste systems. Newer businesses complied mainly due to customer expectations and brand image.
- **Theme 2: Policy Awareness and Communication Gaps**
  Though most businesses knew basic rules (segregation, no dumping), this knowledge was informal and lacked structured guidance or formal training.
- **Theme 3: Sector-Specific Awareness Tools**
  Business owners demanded tailored, simple instructions in Malayalam suited to their specific operations (e.g., meat shops, tea stalls).
- **Theme 4: Infrastructure Gaps**
  Uneven access to bins and collection systems led to self-managed, often unhygienic, waste storage in remote areas.
- **Theme 5: Spatial Inequities**
  Urban businesses had better support and monitoring. Rural ones lacked collection services, leading to poor waste handling practices.
- **Theme 6: System Effectiveness and Gaps**
  While owners appreciated decentralization and Haritha Karma Sena, they cited irregular collection, no grievance redressal, and seasonal inefficiencies.
- **Theme 7: Environmental Awareness**
  Most respondents linked poor waste practices to pollution and tourism damage and advocated for sustainable alternatives like composting.
- **Theme 8: Motivation and Enforcement**
  Waste compliance was driven by fear of fines, customer demands, and personal values. Enforcement was seen as inconsistent and unfair.

- **Theme 9: Practical Suggestions**
  Stakeholders suggested signage, technology use (e.g., WhatsApp alerts), stricter enforcement, tourist education, and "green business" certifications.

# 19. Integration with Hypotheses (Quantitative vs. Qualitative)

Table 19.1 Integration with Hypotheses (Quantitative vs. Qualitative)

| Hypothesis | Quantitative Result | Qualitative Interpretation |
|---|---|---|
| H1: Policy gaps ↔ policy influence | Weak, not significant | Despite gaps, influence is enforced by inspections and social pressure. |
| H2: Policy gaps ↔ waste practices | Strong, significant | Policy lapses lead to operational issues, e.g., missing bins, irregular collection. |
| H3: Policy gaps ↔ community engagement | Weak, not significant | Engagement driven by social norms and customers, not policies. |
| H4: Policy influence ↔ waste practices | Strong, significant | Clear instructions and local authority presence improves compliance. |
| H5: Community engagement ↔ waste practices | Strong, significant | Peer behavior and community expectations encourage better waste handling. |
| H6: Policy influence ↔ sustainability | Weak, not significant | Rules followed out of fear, not environmental concern. |
| H7: Waste practices ↔ sustainability | Moderate, significant | Those who segregate and recycle are more aware of environmental impact. |
| H8: Community engagement ↔ sustainability | Strong, significant | Close-knit communities adopt shared sustainable practices. |
| H9: Age ↔ engagement | No significant link | Engagement driven by social context, not age. |
| H10: Demographics ↔ policy gap perception | Not significant | Real-world experience matters more than education/income. |

The thematic and statistical results together highlight that enforcement, social norms, and experiential learning are the strongest drivers of compliance and sustainability in waste

management. Policy gaps hurt efficiency, but people still follow rules due to external motivators. Infrastructure and communication issues must be addressed urgently. A participatory, context-sensitive, and community-led approach is essential to improve waste systems in Kerala's hill stations.

# 20. Findings, Recommendations, and Conclusions

This chapter presents the final findings, practical recommendations, and conclusive insights derived from both quantitative and qualitative data. The study investigated how policy implementation gaps, community engagement, and socio-demographic factors influence waste management practices and environmental sustainability in Kerala's hill stations (specifically Wayanad and Idukki).

## 20.1 Key Findings

1. **Policy Implementation Gaps & Waste Management**

   There are severe implementation issues like irregular collection, unclear segregation guidelines, poor infrastructure, and weak enforcement. Businesses in remote areas often burn or dump waste due to a lack of alternatives. Qualitative interviews confirmed these challenges, emphasizing a critical need for improved clarity, regular collection, and infrastructural support.

2. **Policy Gaps & Community Engagement**

   While statistics did not show a strong correlation, interviews revealed that **community engagement** is shaped more by social pressure, peer practices, and customer expectations than by awareness of policy flaws.

3. **Policy Influence on Waste Practices**

   A **strong positive link** exists between perceived policy influence and good waste practices. Clear communication, routine inspections by Haritha Karma Sena, and visible enforcement were key factors encouraging businesses to comply with rules.

4. **Community Engagement & Waste Practices**

   Businesses participating in local clean-up efforts and peer-influenced environments maintained cleaner premises and followed proper waste handling. Social norms and ecological concerns were powerful motivators.

5. **Policies & Sustainability**

   Surprisingly, businesses didn't associate waste policies with environmental protection. They viewed them as regulatory obligations, not sustainability tools. This

shows a need to reposition policy communication to emphasize environmental benefits.

6. **Waste Management & Environmental Sustainability**

   A **strong positive correlation** was found. Businesses that followed practices like recycling and composting were more aware of sustainability, linking good waste habits to eco-consciousness.

7. **Community Engagement & Sustainability**

   High community participation directly enhanced sustainability outcomes. Businesses in communities that encouraged eco-friendly practices were more likely to maintain them.

8. **Age & Engagement**

   There was **no significant difference** in waste management practices between younger and older business owners. Both acted based on customer expectations and social accountability.

9. **Demographics & Policy Gap Awareness**

   Education and income levels had **no impact** on how policy gaps were perceived. Real-life experience was more influential than formal education or economic status in identifying implementation issues.

10. **Policy Gaps & Policy Influence**

    Businesses were aware of policy gaps but did not allow them to reduce their compliance. Enforcement, customer views, and fear of penalties played a bigger role in determining behavior than policy awareness.

## 20.2 Recommendations

1. **Stronger Policy Implementation**

   Ensure regular collection, clearer segregation rules, better infrastructure, and stricter enforcement. Train and expand Haritha Karma Sena teams.

2. **Community-Based Engagement**

   Use social pressure positively—support peer-led awareness programs, reward compliance (e.g., Green Business Certificates), and encourage business clusters to monitor each other.

3. **Clarify Environmental Benefits**

   Waste policies should be explained in terms of their impact on nature. Use simple, multilingual communication tools including social media and visuals.

4. **Improve Infrastructure**

   Provide bins, recycling units, and composting systems across business zones, especially in underserved areas.
5. **Participatory Policy Design**

   Include business owners in discussions, seek their feedback regularly, and tailor solutions based on local challenges.
6. **Leverage Social and Tourist Influence**

   Label eco-friendly businesses, host clean-market competitions, and promote them on public platforms to attract customers and motivate others.
7. **Sector-Specific Training**

   Tailor training for different industries (e.g., meat shops, restaurants) using workshops, videos, and NGO collaborations.
8. **Context-Sensitive Sustainability Models**

   Design business-type specific programs—composting in food businesses, plastic bans in tourist zones, etc.
9. **Monitoring & Evaluation**

   Conduct audits, surprise inspections, and provide mobile apps to report problems and track compliance.
10. **Ongoing Education Campaigns**

    Use schools, media, NGOs, and communities to promote responsible waste behavior using simple tools suited for different audiences.

# Conclusion

The study concludes that effective waste management in Kerala's hill stations is hindered by policy implementation gaps but strengthened by community pressure, customer expectations, and local enforcement. Demographics like age or education do not significantly affect engagement or policy understanding. Sustainability is achieved when waste practices are contextual, community-driven, and clearly linked to environmental goals. A participatory and inclusive approach—where local stakeholders actively shape and implement solutions—can lead to cleaner, greener hill stations in Kerala.

# References


1. Achmadi, R., & Choiriyah, I. U. (2024). Waste Management Strategies by Village Governments. DOI: 10.21070/ijler.v19i4.1174.
2. Ahmed, N., Khuda, A., & Chowdhury, S. J., et al. (2024). Youth-Driven, Community-Engaged Waste Management. *Journal of Community Informatics*. DOI: 10.15353/joci.v20i1.5289.
3. Chisanga, A., Saul, S. T., & Daka, S. et al. (2024). Community Engagement in Solid Waste Management: An In-Depth Analysis of Household Participation. *International Journal of Research and Innovation in Social Science*. DOI: 10.47772/ijriss.2024.804147.
4. Colon, M., & Fawcett, B. (2006). Community-based household waste management: Lessons learnt from EXNORA's 'zero waste management' scheme. *Habitat International, 30*, 916–931. DOI: 10.1016/J.HABITATINT.2005.04.006.
5. Ekanthalu, V. S., et al. (2023). Review of the existing organic waste management situation in Kerala. *The Journal of Solid Waste Technology and Management.* https://doi.org/10.5276/jswtm/iswmaw/494/2023.422
6. Goris, L. M., et al. (2017). A system design for solid waste management: A case study of an implementation in Kerala. *2017 IEEE Region 10 Symposium (TENSYMP)*. https://doi.org/10.1109/TENCONSPRING.2017.8070106
7. Goris, L. M., Harish, M. T., & Bhavani, R. (2017). A system design for solid waste management: A case study in Kerala. *IEEE Region 10 Symposium*. DOI: 10.1109/TENCONSPRING.2017.8070106.
8. Kaithery, N. N., & Karunakaran, U. (2019). A study on awareness of household waste management in a rural area of northern Kerala. *International Journal Of Community Medicine And Public Health.* https://doi.org/10.18203/2394-6040.IJCMPH20191826
9. Kumar, M., & Nandini, N. (2013). Community attitude, perception, and willingness towards solid waste management in Bangalore city. *International Journal on Environmental Sciences*, 4, 87–95. Retrieved from Consensus.
10. Kumar, R. (2015). Waste Management Initiatives in Rural India. DOI: 10.4018/978-1-4666-8259-7.CH024.
11. Magriaty, R., Murtilaksono, K., & Anwar, S. (2020). The Impact of Government Policy Regarding Waste Management. DOI: 10.21787/jbp.12.2020.89-99.

12. Mutobe, B., Mubanga, K., & Nchito, W. (2022). Residents' Participation in Solid Waste Management in Solwezi District. *Journal of Environment*. DOI: 10.47941/je.778.
13. Prakasam, V., & Das, S. Y. (2016). A sustainable approach to municipal solid waste management in Neyyatinkara Municipality, Kerala, India. *Applied Ecology and Environmental Sciences, 4*(4), 89-95. https://doi.org/10.12691/AEES-4-4-2
14. Pratama, A., Kamarubiani, N., & Shantini, Y. et al. (2021). Community Empowerment in Waste Management. *Proceedings of the First Transnational Webinar on Adult and Continuing Education (TRACED 2020)*. DOI: 10.2991/ASSEHR.K.210508.015.
15. Sewak, A., Deshpande, S., & Rundle-Thiele, S., et al. (2021). Community perspectives and engagement in sustainable solid waste management (SWM) in Fiji. *Journal of Environmental Management, 298*, 113455. DOI: 10.1016/j.jenvman.2021.113455.
16. Subramoniam, V., & Suresh, V. (2015). A study on the waste disposal practices and its impact in Alappad Panchayat, Kerala. *International Journal of Social Sciences and Management, 2*(2), 97-101. https://doi.org/10.3126/IJSSM.V2I2.12289
17. Tarigan, L., Rogaleli, Y. C., & Waangsir, F. W. (2020). Community participation in waste management. *International Journal of Public Health Science (IJPHS)*. DOI: 10.11591/IJPHS.V9I2.20380.
18. Zaman, A. K. M. T. U. (2024). Assessment of Solid Waste Management Practices in Rural Bangladesh. *Research in Agriculture Livestock and Fisheries, 10*(3), 301–318. DOI: 10.3329/ralf.v10i3.71000.

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